

REMARKS

This response is intended as a full response to the Final Office Action dated July 6, 2006. In view of the following discussion, the Applicants believe that all claims are in allowable form.

SPECIFICATION OBJECTION

The amendment to claims 1 and 11, filed March 14, 2006 is objected to under 35 USC §132(a) as introduction of new matter. The Applicants respectfully disagree.

With respect to an objection to the specification under 35 USC §132(a), the MPEP §706.03(o) (Examiner Note 3) states that if new matter is added only to a claim, an objection should not be made under this paragraph, instead the claim should be rejected under 35 USC §112, 1st Paragraph. Accordingly, the Applicants believe the present rejection is improper and that the appropriate action in this situation by the Examiner, if any, is a rejection under 35 USC §112, 1st Paragraph.

However, the Applicants disagree that the amendment made to claims 1 and 11 in the response filed March 14, 2006 introduce new matter. The previous Response to Office Action contained amendments to claims 1 and 11 to include "wherein the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the material in Angstroms." These claim limitations are supported by the originally filed specification at least in paragraphs [0018] and [0028]. Paragraph [0018] states "[t]he invention finds specific use when the thickness of the layer is on the order of the wavelength of the light used for endpoint detection." Paragraph [0028] provides "[t]he substrate 200 is illuminated using, e.g., a broadband radiation source 690 that produces radiation having wavelengths that are on the order of the thickness of the layer being etched, e.g., within a range from about 200 to 800 nm, i.e., in ultra-violet and deep ultra-violet ranges. The thickness of the layer being etched may be 5 to 300 Angstroms." The Applicants believe that these originally filed statements explicitly and inherently support the objected to amendments made during the previous Response to Office Action.

The amendments at issue are supported explicitly in paragraphs [0018] and [0028], whereas the paragraphs disclose that "the thickness of the layer is on the order

of the wavelength” and “wavelengths that are on the order of the thickness of the layer being etched,” respectively. The amendment is also supported implicitly by example in paragraph [0028], where it states “e.g., within a range from about 200 to 800 nm [...] [and t]he thickness of the layer being etched may be 5 to 300 Angstroms.” The Supreme Court has held that the patent law permits applicants to make explicit, by an amendment to the specification, what is implicit in an application. (*Marconi Wireless Tel. Co. v United States*, 320 U.S. 1 (1943).) Furthermore, claim amendments are proper where they merely clarify and explain in greater detail, embodiments described in the original application. (*Id.*) In accordance with *Marconi Wireless*, and in view of the above remarks, the Applicants submit that the amendments to claims 1 and 11 are supported by the originally disclosed specification.

Thus, the Applicants respectfully request that the objection to the specification be withdrawn.

CLAIM REJECTIONS

A. 35 USC §112, First Paragraph Claims 1-21, 42 and 43

Claims 1-21, 42 and 43 stand rejected under 35 USC §112, 1st Paragraph, as failing to comply with the written description requirement. Specifically, the Examiner asserts that amendments to claims 1 and 11 to include “wherein the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the material in Angstroms,” contains subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors had possession of the claimed invention at the time the application was filed. The Applicants respectfully disagree.

As discussed in detail above, these claim limitations are supported by the originally filed specification at least in paragraphs [0018] and [0028], wherein specific numeric examples are provided of the invention as claimed. Accordingly, the Applicants contend the amendments are supported by the originally filed specification.

Thus, the Applicants respectfully request that the present rejection be withdrawn, and the claims allowed.

B. 35 USC §102 Claims 1-5, 7-10 and 42; 11, 12, 14-16, 18-21 and 43

Claims 1-5, 7-10 and 42; 11, 12, 14-16, 18-21 and 43 stand rejected as being anticipated by United States Patent No. 5,825,221 issued November 10, 1998, to *Lee, et al.* (hereinafter *Lee*). Applicants respectfully disagree.

Independent claims 1 and 11 recite limitations not taught or suggested by *Lee*. With respect to 35 USC §102, or "anticipation," the Federal Circuit has repeatedly stated that "there is no anticipation unless all of the same elements are found in exactly the same situation and united in the same way . . . in a single prior art reference." Perkin-Elmer Corp. v. Computervision Corp., 732 F.2d 888, 894 (Fed. Cir., 1984); Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771, 218 U.S.P.Q. (BNA) 781, 789 (Fed. Cir. 1983).

Lee discloses providing a substrate comprising a material layer having an initial thickness, etching the material layer on the substrate, directing radiation onto the substrate as the material layer is etched, measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength, and terminating the etch step upon measuring a predetermined metric for the change in intensity radiation reflected from the substrate at the pre-selected wavelength. However, *Lee* does not disclose "wherein the pre-selected wavelength in nanometers is greater than or on the order of the material layer in Angstroms," as recited in claim 1, nor "wherein the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the gate dielectric layer in Angstroms," as recited in claim 11.

The Examiner cites *Lee*, in reference to Figure 2, listing the material layers as a 1500 Å oxide mask, a 1125 Å TiN film, and a 1625 Å polysilicon film. Similarly, with reference to Figure 3, the Examiner cites the material layers as a 1000 to 2000 Å oxide mask, a 1000 Å titanium nitride film, and a 2000 Å polysilicon film. Every one of these material layers cited by the Examiner, as well as every material layer disclosed in the reference, is on the order of thousands of Angstroms.

The Examiner also cites the pre-selected wavelengths used to etch the material layers disclosed by *Lee* as being 2.0 eV (~620 nm), 2.8 eV (~443 nm), 3.3 eV (~376) and 4.0 eV (~310 nm). Every one of these wavelengths cited by the Examiner, as well as every wavelength disclosed in the reference, is on the order of hundreds of

nanometers. Accordingly, *Lee* does not disclose “wherein the pre-selected wavelength in nanometers is greater than or on the order of the material layer in Angstroms” because every disclosed wavelength in nanometers (i.e., hundreds) is less than the order of the thickness of the disclosed material layers in Angstroms (i.e., thousands). Therefore, a *prima facie* case of anticipation has not been established because *Lee* does not identify each of the claimed elements as arranged in claims 1 and 11.

With respect to claims 3 and 14, *Lee* fails to disclose “wherein the thickness of the material layer is 5 to 300 Angstroms” and “wherein the thickness of the gate dielectric layer is about 5 to 300 Angstroms.” The Examiner cites the “70 Å thick gate oxide” in reference to Figure 3 as disclosing a material layer within the claimed thickness. However, as explicitly recited in claims 1 and 11, the material layer (or gate dielectric layer) is a layer which is etched during the claimed method, not merely one disposed on a substrate. The gate oxide layer of *Lee*, as cited by the examiner, is not a material layer, or gate dielectric layer, etched by the method as claimed by the Applicants. Therefore, a *prima facie* case of anticipation has not been established because *Lee* does not identify each of the claimed elements as arranged in claims 3 and 14.

Furthermore, with respect to 42 and similarly to claim 43, *Lee* fails to disclose “wherein the thickness of the material layer is 20 to 100 Angstroms” and “wherein the thickness of the gate dielectric layer is 20 to 100 Angstroms.” As discussed above, *Lee* fails to teach or suggest that the thickness of the material layer or gate dielectric layer being etched is 20 to 100 Angstroms, as recited in claims 42 and 43, respectively. Therefore, a *prima facie* case of anticipation has not been established because *Lee* does not identify each of the claimed elements as arranged in claims 42 and 43.

Thus, independent claims 1 and 11, and claims 2-5, 7-10 and 42; 12, 14-16, 18-21 and 43 depending therefrom, are patentable over *Lee*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claims allowed.

C. 35 USC §103 Claims 6 and 17

Claims 6 and 17 stand rejected as being unpatentable over *Lee* in view of United States Patent No. 6,406,924 B1, issued June 18, 2002, to *Grimbergen et al.* (hereinafter *Grimbergen*). The Applicants respectfully disagree.

Independent claims 1 and 11, from which claims 6 and 17 respectively depend, recite limitations not taught or suggested by any combination of *Grimbergen* and *Lee*. The patentability of claims 1 and 11 over *Lee* has been discussed above. *Grimbergen* teaches an endpoint detection method for use in the fabrication of electronic devices. Specifically, *Grimbergen* teaches selection of a radiation having a wavelength that is substantially absorbed in a first thickness of a layer disposed on a substrate and that is at least partially transmitted through a second thickness of the layer after processing. (*Grimbergen*, Abstract; Summary; col. 8, ll. 15-60. However, *Grimbergen* does not teach or suggest endpoint detection techniques using a pre-selected wavelength that is greater than or on the order of the initial thickness of the material layer. In fact, the examples provided by *Grimbergen* utilize wavelengths in nanometers (e.g., 365) that are less than the thickness of the layers in Angstroms (e.g., 5000 or 2000).

Accordingly, the teachings of *Grimbergen* cannot be used to modify *Lee* in a manner that yields an etch endpoint detection process that etches a high-k dielectric layer disposed on a substrate, wherein the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the material layer in Angstroms, as recited in independent claims 1 and 11. Therefore, a *prima facie* case of obviousness has not been established because the combination of *Lee* and *Grimbergen* fails to yield each of the claimed elements of independent claims 1 and 11, and claims 6 and 17, depending therefrom.

Thus, claims 6 and 17 are patentable over *Lee* in view of *Grimbergen*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claims allowed.

D. 35 USC §103 Claim 13

Claims 13 stands rejected as being unpatentable over *Lee* in view of United States Patent No. 6,518,106 B2, issued February 11, 2003, to *Ngai et al.* (hereinafter *Ngai*). The Applicants respectfully disagree.

Independent claim 11, from which claim 13 depends, recites limitations not taught or suggested by any combination of *Ngai* and *Lee*. The patentability of claim 11 over *Lee* has been discussed above. The Examiner cites *Ngai* to show that using SiO₂ and HfO₂ as gate dielectrics is well known. However, *Ngai* fails to teach or suggest any etch specific endpoint detection methodologies. Specifically, *Ngai* fails to teach or suggest endpoint detection techniques using a pre-selected wavelength that is greater than or on the order of the initial thickness of the material layer.

Accordingly, the teachings of *Ngai* cannot be used to modify *Lee* in a manner that yields providing a substrate comprising a material layer having an initial thickness, wherein the material layer is a high-k dielectric material layer; directing radiation onto the substrate as the material layer is etched; and measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength as the material layer is etched, wherein the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the material layer in Angstroms, wherein the gate dielectric layer comprises at least one film of hafnium dioxide (HfO₂) and hafnium silicate (HfSiO₂), as recited in claim 13. Therefore, a *prima facie* case of obviousness has not been established because the combination of *Lee* and *Ngai* fails to yield each of the claimed elements of claim 13.

Thus, claim 13 is patentable over *Lee* in view of *Ngai*. Accordingly, the Applicants respectfully request that the rejection be withdrawn and the claim allowed.

CONCLUSION

The Applicants submit that all claims now pending are in condition for allowance. Accordingly, both consideration of this application and swift passage to issue are earnestly solicited. If the Examiner believes that any unresolved issues still exist, it is requested that the Examiner telephone Alan Taboada at (732) 935-7100 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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